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ABSTRACT

A survey of the use of eight decision-science techniques was conducted in a stratified random cample of school districts in the United States. The purpose of the study was to determine the relative use frequency of these techniques in 14 application areas and the potential uses of the techniques in the school districts. The amount of formal training that the respondents (usually superintendents of schools) have had in the eight techniques was tallied, in addition to the areas in which they desired training or additional training. The conclusion of the study is that there is a need to train more educational administrators in the decision sciences in order that greater use of these techniques can be applied to the administration of the schools. (Author)

THE USE OF DECISION SCIENCES IN EDUCATIONAL ADMINISTRATION

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the American Institute for Decision Sciences
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ABSTRACT

A survey of the use of eight decision-science techniques was conducted in a stratified random sample of school districts in the United States. The purpose of the study was to determine the relative frequency of use of the techniques in fourteen application areas. Also sought was information on the potential uses of these techniques in the school districts. The amount of formal training that the respondents (usually superintendents of schools) have had in the eight techniques was tallied in addition to the areas where they desired training or additional training. The conclusion of this preliminary study is that there is a need to train more educational administrators in the decision sciences so that greater use of these techniques can be applied to the administration of the schools.

INTRODUCTION

During most of the history of this country, the management of schools has been a function of laymen who were neither professional educators nor professional administrators. Educational administration did not evolve as a field of study until the twentieth century when the work of administrative scientists such as Taylor, Fayol, Barnard and Simon was applied to the management of schools. Traditionally, educational administrators consider themselves educators who have some administrative responsibilities. With the ever escalating costs involved in providing educational services, the increase in the number and complexity of requests for services, and the intense competition for tax monies, an increasing number of complex decisions filled with uncertainty is confronting the school administrator. The wise educational administrator, who still considers himself primarily an educator, is learning as much as he can about reducing the uncertainty in the decision-making process. The decision sciences have certainly had major impacts on decision-making in business, the military and the government, so logically, educational administration is a field that also is utilizing these tools.

But wait a minute, that <u>sounds</u> right, but <u>is</u> it right? What evidence do we have to document the use of the decision sciences in educational administration? Mathews, Bishop and Christopher presented a paper at a recent Southeastern AIDS meeting that reviewed the literature on educational applications of PERT, PPBS, MIS, LP, and other assorted decision science techniques. But the literature is more likely to present the state

of the art, not the measure of use.

It occured to me that a survey that would provide some information on the decision-science techniques and associated applications that are used in the school districts would be of interest.

The eight techniques that were studied are: management information systems (MIS), cost/benefit analysis, simulation, projection, program evaluation and review technique (PERT), planning-programming-budgeting system (PPBS), linear programming and management by objectives (MBO). (The last one is admittedly a weak qualifier as a decision-science technique, but was of interest and therefore included in this study.)

An instrument was designed that would collect data to answer the following questions: (1) For the application areas of interest, which of the eight techniques were most often and least often used? (2) Which of the eight techniques were viewed as having the most potential use? (3) For which of the application areas were the eight tools most often used? (4) Which of the application areas were seen as having the greatest potential advantage for application of the decision-science tools? (5) How many administrators were trained in the various decision science techniques? (6) In which of the eight tools are the administrators interested in receiving training or further training?

THE SURVEY

In order to assess the actual and potential use of eight techniques, a stratified random aample of public school districts with 12 grades was drawn. Table 1 shows the sizes of the various strata, the number of school districts in each and the size and percentage of the sample in each stratum. The eight public school districts in the country that have more than 200,000 pupils were not included in the study.

TABLE 1

The Sampling Stratification and the Response

Student Population in School District	Number of Districts	Number in Sample	% in Sample	Number Returned	% Returned
Over 200,000	8	0	0	--	--
100,001-200,000	21	21	100	17	81
50,001-100,000	51	20	40	16	80
25,001- 50,000	104	31	30	19	61
10,001- 25,000	561	56	10	31	55
TOTAL	745	128		83	65

A questionnaire was sent to the superintendent of schools of each of the school districts in the sample. The questionnaire asked the superintendent to report the current and potential applications of eight decision-science techniques. A list of

fourteen possible application areas was also part of the questionnaire, as was a page of definitions of the decision-science techniques.

Limitations of the Study

Admittedly, this data collection was primitive, and possible validity and reliability problems exist with an instrument of this type. Twenty percent of the time the respondent was someone other than the superintendent. An additional concern appears since the reported applications of the techniques undoubtedly varied in scope and sophistication, but each was counted with equal weight in the discussion that follows. Another potential distortion concerns the pooling of the data from each of the strata of student population.

RESULTS OF THE SURVEY

The initial mailing was conducted in November of 1972 with two follow-up mailings. Eight-three of the 128 questionnaires were returned for a 65 percent response rate. Following are some general results of the collected data.

The Decision Science Techniques

The most widely used of the eight decision-science techniques for the 14 listed education applications were projection techniques (each school system reportedly averaged almost three applications), management information systems and cost/benefit analysis. Other techniques frequently employed were PPBS, MBO

and simulation. The least used of the eight were linear programming and PERT (about one each per system).

On the average, each respondent listed almost two potential applications in his school district for cost/benefit analysis and simulation with almost as many potential uses for PPBS and MIS. Projection techniques, linear programming, PERT and MBO each were chosen as a potentially useful technique for one application per school district, on the average. See Table 2 for a breakdown by the pupil population of school district.

Table 2 about here

Projection techniques were reported to be used most frequently with "enrollment studies," "preparation of salary schedules", and "student class scheduling." Application areas that were most frequently mentioned as potential uses for projection techniques were "physical plant remodeling or expansion," "site location for physical plant additions," "preparation of salary schedule," and "inventory control."

The responses show that MIS was used most frequently with "student records" and "federal or state reporting." "Student records," "inventory control," and "evaluation of staff performance" were the most commonly reported potential uses for MIS.

Cost/benefit analysis was mentioned most frequently as a technique that was being applied to "rent/buy decisions,"

"physical plant remodeling or expansion" and "budgetary procedures and control." "Inventory control," "rent/buy decisions," and "physical plant remodeling or expansion" were most often cited as possible uses for cost/benefit analysis.

It was reported that PPBS was used in 48 percent of the systems for "budgetary procedures or control." This application was also listed by 25 percent of the respondents as an MIS application of potential value. "Physical plant remodeling or expansion" also was mentioned frequently as a potential use of PPBS.

Over half of those who sent back the questionnaire said that they used MBO in the "evaluation of staff performance." Another 20 percent listed this as a potential use of MBO in their school districts.

Over a third of the respondents claimed the application of simulation in the "preparation of salary schedules" and a quarter of the respondents said that they used simulation for "student class scheduling." An additional quarter saw simulation as potentially useful for the "preparation of salary schedules" in their school districts.

Linear programming was claimed as a tool used in "student class scheduling" by 25 percent of those responding and it was seen as valuable for use in "bus scheduling" by an additional 25 percent of the respondents.

Over a quarter of the respondents claimed the use of PERT for "physical plant remodeling or expansion." Another quarter of the respondents saw this as a potential application for PERT.

The Application Areas

Of the 14 application areas that were listed, the most frequently cited one for which the listed decision-science techniques were being used was "budgetary procedures or control," with an average of almost two citations per district. "Physical plant remodeling or expansion," "preparation of salary schedules," "class scheduling," and "enrollment studies" were mentioned, on the average, more than once per district.

On the average, "physical plant remodeling or expansion" was listed more than once by each of the respondents as an area where one of the decision-science techniques would be useful. "Inventory control," "salary schedules" and "bus scheduling" were mentioned almost as often. Table 3 presents the average number of actual and potential applications over all responding school districts.

Table 3 about here

Training

The average respondent claimed formal training in one-and-one-half of the eight decision-science techniques and would like to have training (or more training) in almost three of the techniques. Thirty percent of the respondents claimed formal

training in MBO, PPBS and well over a third of all those reporting desired training in PPBS, MBO, cost/benefit analysis and MIS. Ten percent or less of the respondents claimed formal training in cost/benefit analysis or linear programming. Interestingly, at least one quarter of the respondents desired training in each of the eight techniques. Table 4 shows the percentages of the respondents who have had training and want training in the eight decision-science tools.

CONCLUSION

Although this study is contaminated with validity questions, it does provide some insights into reported usage of the decision sciences in educational administration in the public schools of the United States.

A higher reported usage of these applications was found than was expected, although it is still felt that the techniques are underutilized.

More importantly, there are many applications of these tools that have been reported as being useful, but not in use. The school administrators appear to recognize the need for further implementation of these decision-science techniques in their own systems and they even express interest in further training in them.

This study indicates that school executives perceive the need for increased training and use of the decision sciences and it directs us to determine these needs more specifically and to make ourselves available to continue to fill them.

Table 2

Actual and Potential Use of Each Decision-Science Technique by Size of Student Population of School District Ordered by Average Number of Reported Uses per School District.

Student Population in School District									
10-25,000		25-50,000		50-100,000		100-200,000		TOTAL	
USES		USES		USES		USES		USES	
Actual	Potential	Actual	Potential	Actual	Potential	Actual	Potential	Actual	Potential
Project. (2.4)	CBA (1.7)	MIS (2.3)	MIS (2.6)	CBA (3.9)	Simulat. (1.6)	Project. (7.3)	Simulat. (2.0)	Project. (2.8)	CBA (1.8)
CBA (1.7)	Simulat. (1.3)	Project. (2.1)	Simulat. (2.5)	MIS (3.8)	CBA (1.6)	MIS (3.5)	CBA (1.6)	MIS (2.5)	Simulat. (1.8)
MIS (1.4)	PPBS (1.1)	CBA (1.6)	PPBS (2.4)	Project. (3.5)	PPBS (1.4)	CBA (3.4)	Projects. (1.5)	CBA (2.4)	PPBS (1.5)
PPBS (1.2)	MIS (1.1)	PPBS (1.6)	CBA (2.4)	PPBS (2.8)	PERT (1.2)	PPBS (2.4)	MIS (1.5)	PPBS (1.9)	MIS (1.4)
Simulat. (0.9)	PERT (0.9)	Simulat. (1.4)	LP (1.8)	MBO (2.8)	Project. (1.1)	Simulat. (1.6)	PPBS (1.4)	MBO (1.4)	Project. (1.2)
LP (0.8)	LP (0.8)	MBO (1.2)	Project. (1.8)	LP (2.1)	LP (1.1)	MBO (1.6)	LP (0.8)	Simulat. (1.3)	LP (1.1)
MBO (0.8)	MBO (0.7)	LP (0.7)	PERT (1.6)	PERT (1.9)	MBO (1.0)	PERT (1.1)	PERT (0.8)	LP (1.1)	PERT (1.1)
PERT (0.6)	Project. (0.7)	PERT (0.7)	MBO (1.2)	Simulat. (1.8)	MIS (0.8)	LP (1.0)	MBO (0.4)	PERT (1.0)	MBO (0.8)
MEAN (2.3	(1.9)	(1.8)	(2.4)	(2.4)	(1.0)	(1.2)	(0.7)	(1.8)	(1.3)

TABLE 3

Actual and Potential Application Areas for the Eight Decision-Science Techniques Ordered by Mean Number of Reported Applications

Actual Applications (Mean Number)		Potential Applications (Mean Number)	
Budgetary Procedures	(1.7)	Physical Plant Construction	(1.2)
Physical Plant Construction	(1.4)	Inventory Control	(1.0)
Preparation of Salary Schedules	(1.3)	Preparation of Salary Schedule	(1.0)
Student Class Schedule	(1.3)	Student Bus Scheduling	(0.9)
Enrollment Studies	(1.3)	Budgetary Procedures	(0.8)
Teacher/Student Assignment	(1.1)	Evaluation of Staff	(0.8)
Building Site Location	(1.0)	Site Location	(0.8)
Evaluation of Staff	(0.9)	Teacher/Student Assignment	(0.8)
Inventory Control	(0.9)	Rent/Buy Decisions	(0.7)
Rent/Buy Decisions	(0.9)	Sports/Co-curricular Scheduling	(0.7)
Federal/State Reporting	(0.9)	Student Class Scheduling	(0.6)
Student Bus Scheduling	(0.8)	Federal/State Reporting	(0.5)
Student Records	(0.7)	Enrollment Studies	(0.5)
Sports/Co-curricular Scheduling	(0.4)	Student Records	(0.4)
MEAN	(1.0)	MEAN	(0.8)

TABLE 4

Percentage of Respondents who Received Formal Training and Desire Formal Training in the Eight Decision-Science Techniques

	Report on Training	
Techniques	Had Training (%)	Desire Training (%)
MBO	32	44
PPBS	30	45
Simulation	20	32
PERT	20	28
MIS	18	37
Projection	14	27
LP	10	27
CBA	6	43
MEAN	19	36